Hydrogen-selective silica-base membranes

structure, permeability and stability

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Hydrogen-selective silica-base membranes: structure, permeability and stability

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Amorphous silica membranes fabricated by the sol-gel method show high hydrogen permeability and at the same time are almost impermeable to larger gas molecules as carbon dioxide and methane. In reason of that, these devices are attractive for developing highly efficient hydrogen separation systems. Large energy savings are expected by substitution of the traditional cryo-distillation and adsorption processes by hydrogen-selective silica membranes. Despite that, silica membranes have not been commercialized yet, mainly due to high concerns about their stability. Indeed, hydrothermal conditions, which are typical for hydrogen-forming processes, have been reported to be detrimental to both hydrogen permeability and selectivity of silica membranes. The stability of silica membranes can be improved by transition metal oxide doping. However, the structure and the mechanisms underneath hydrothermal aging of silica membranes are not well understood yet, and the development of doped silica membranes is still mainly attained by an empirical approach. This study provides novel information about structure, permeability and stability of silica membranes, and therefore provides new tools for developing highly stable silica-based membrane materials [1,2].

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2. M. Facciotti, V. Boffa, G. Magnacca, L.B. Jørgensen, P.K. Kristensen, A. Farsi, K. König, M.L. Christensen, Y. Yue, **2014**, *Deposition of thin ultrafiltration membranes on commercial SiC microfiltration tubes*, Ceramics International, 40, 3277–3285.